

residual oil measuring system

oilguardPRO



**functional description,
mounting and operating instructions**



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1 Manufacturer's information

Manufacturer's Information

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2 Scope of supply

The Residual oil measuring instrument is supplied in ready-to-use condition. The scope of supply includes sampling probe with connection hose and test certificate.

 The transport packaging is to be again properly reused during full return (including the thermocoal corners). Please keep them and do not dispose off!



Please read the operating manual of the product before putting into operation. Apart from the operating instructions, there is also important information in various chapters about installation, commissioning and trouble shooting.

3 General dangers and precautions



Please carefully read the following instructions before putting into operation! The symbols used in the operating manual are to make you careful, before hand, regarding safety considerations and dangers. But all these symbols cannot substitute the text of the associated safety instructions in any way. Therefore, the instructions should also be always read completely!



This symbol indicates likely danger for persons, material or environment. The information provided in the associated text should be duly followed to avoid any kind of risk.



This symbol refers to important application notes and tips, which are necessary for successful working and should to be absolutely followed to ensure good results.



Functional checks, installation, settings and servicing should be performed by only authorized personnel. A device calibration is generally possible only in the Pro air GmbH at the manufacturer's works.



This symbol indicates operations that can also be executed by the user, provided they are accordingly technically qualified and authorized.

3.1 Safety instructions for electrical connections



The product should only be used and applied as per its intended application.

The voltage carrying parts carry danger to life. The device should not be opened. The installation of the device should be done only by trained personnel. Mounting and servicing should be done only in switched off condition.

The protective grounding must be done as per technical guidelines.

The product is not for control of systems, which perform safety related functions. In normal operation also, there is always a danger of malfunctioning, for example because of over voltage or failure of components. The user has to ensure that there are no consequential damages due to malfunctioning or undefined device status. This can be achieved, for example, through redundant components or protection circuits.

Due to wrong tightening torque applied on screws of the connection terminals or by use of inappropriate tool, the terminals can get damaged because of which the insulation or the contact can get disturbed. Badly connected leads can come out during operation and represent a considerable hazard potential. Through contact resistance at the terminal connections there is high heat generation which can lead to fire. Wrongly wired connections can destroy electric components and cause other damages.

In case of broken seals or locks, opening the housing, improper handling or use of force, the warranty claim becomes void!

3.2 Safety instructions for compressed air systems



The energy contained in the compressed gas can lead to unforeseen incidents causing injuries or damage to objects. The risk increases as per the operating pressure of the plant. Hence, all activities should be performed by only trained personnel. In all activities at the compressed air system, a corresponding level of care is necessary to avoid any damage!

The loud disturbing noises caused by uncontrolled opening of lines under pressure can cause damage to hearing or frighten other persons in the vicinity.

At high flow rates, the foreign bodies swept along can act like projectiles and cause injuries to skin or eyes.

Before working on compressed air system, the pressure should be released as per the requirements of the manufacturer.

While opening the screw connections or valves, serious injuries can be caused by compressed air. Always wear personal protective accessories while working on the compressed air network!

The standard model of the device is suitable up to 10 bar. This maximum allowable pressure should not be exceeded. Upstream components should be rated as per the operating pressure and application temperature of the plant.

The regional guidelines applicable at the site for pressure equipment should be carefully followed.

4 Important application notes

4.1 Avoiding damage to the measuring probe



Instruments are sensitive and must be treated carefully: Avoid impact, shocks and vibration.

The shipment of the device should be done only in the original transport packing. If you do not have this, you can order from us.

The sinter filter protects the sensor against mechanical effects and contamination. Do not remove the filter. Use the measuring probe only with sinter filter in intact condition!

Before installation, ensure that the measuring point has no condensed water, oil or dirt secretion! If this is the case, then first put the system in order and dry up!

General principle: If you have doubts, you should contact the manufacturer, before you risk errors and damage by experimenting on the object!

4.2 Calibration and measuring accuracy

The instruments are calibrated and checked before delivery in an elaborate calibration method with reference to chemical analysis systems for several hydrocarbons concentration. Adjustment by end user is not possible.

Please take care of the allowable application temperature range. Exceeding the temperature limit endangers the functioning of internal device components.

The specified data, specially the achievable measuring accuracy, are based on the target material Hexane (C_6H_{14}).

The test gas, available as accessories is for checking the measuring accuracy. The application guidelines must be followed. Further information is available on request.

With proper application, the sensor is to be used for years. To prevent errors, we recommend 12 - month calibration intervals, especially while using the probe in critical applications in the lower hydrocarbon range. For this, the device has an maintenance status indicator which must be watched.

4.3 Intended use



The residual oil instrument is intended to measure organic and inorganic gas impurities in clean, dry compressed air. The application of the instrument is allowed only after filtering and drying. The details specified in the technical data refers to 20 ° C ambient temperature and the target material Hexane (C_6H_{14}). The working pressure of the standard model is 4 ... 10 bar (0.4 ... 1 Mpa). As per application and measuring range, the maximum allowable dew point should not be exceeded.

5 Residual oil measurement in compressed air systems

To ensure the quality of compressed air, it is absolute necessary to monitor the important parameters. apart from dew point as a critical dimension, the residual oil content plays a vital role. Many production processes depend on clean, treated compressed air without traces of hydrocarbons, for example, in pharmacy, chemical industry or semiconductor manufacturing.

The residual oil plays an important role specially in the distribution mechanisms. If the oil content rises over the critical level, for example, because of incomplete filtered aerosol, the complete plant gets contaminated in a very short time. Since the oil has a very low vapour pressure, it takes relatively long time to bring back the plant to completely "Oil free" condition. The effort of cleaning of pipe network choked with oil can lead to very high costs.

An oil outbreak is often detected very late, normally only when quality problems have already appeared and large damages is caused. Therefore, the high quality requirements in the industry requires a continuous residual oil monitoring, that is reliable and provides long term stable service. This is the only way to detect problems before the damage occurs.

The oilguardPRO with its calibrated measuring range of 0.01 ... 5 mg/m³ is the ideal measuring system for monitoring of compressed air plants. The device is meant for stationary applications.

5.1 Characteristic features

- ▶ Monitoring of organic and inorganic gas impurities
- ▶ Guaranteeing compressed air quality as per ISO 8573-5
- ▶ Standard version up to 10 bar for industrial compressed air systems
- ▶ Large, overview display
- ▶ Adjustable pre-alarm and main alarm over 2 separate relay outputs
- ▶ Acoustic and optical signal indicator in alarm management integrated in the device
- ▶ Analogue output
- ▶ Serial interface
- ▶ Simple operation over keyboard, clear operating sequence
- ▶ Long term stable MOS semi-conductor sensor

5.2 Typical areas of application

- ▶ Monitoring of compressed air for pharmacy and food industry
- ▶ Monitoring of adsorption active charcoal filter
- ▶ Monitoring of medical breathing gas as per DIN/ISO 7396-1:2007

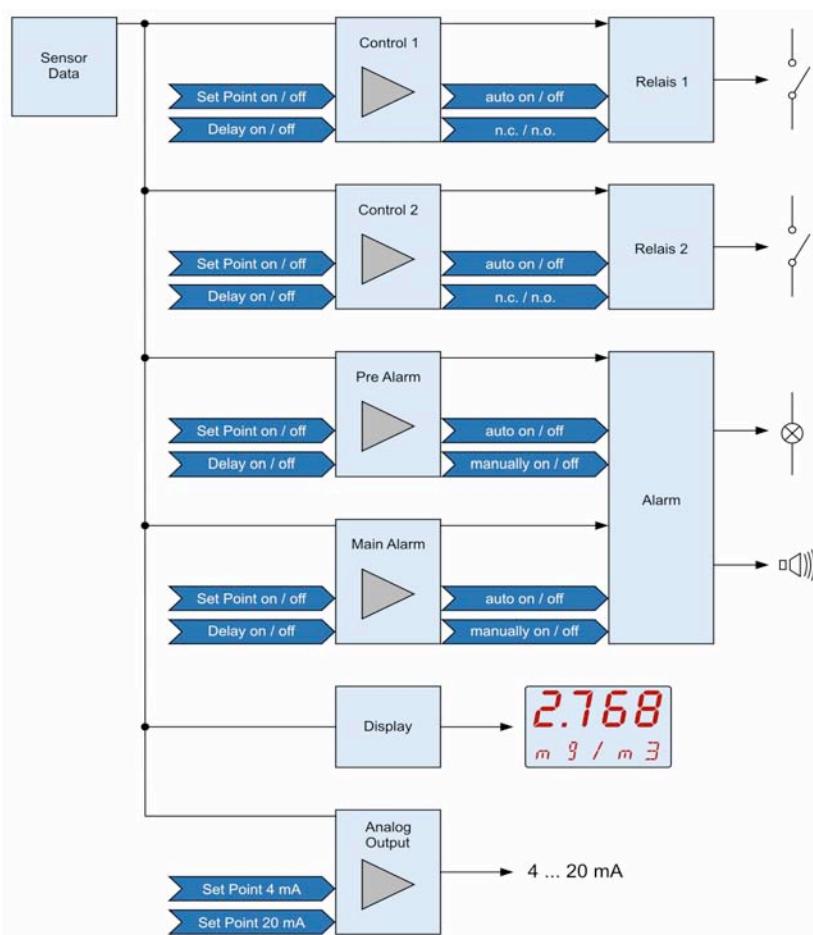
5.3 Features

The oilguardPRO is a stationary air monitoring system specially developed for monitoring of organic and inorganic gas impurities as well as gaseous hydrocarbons in compressed air systems. The oilguardPRO can be used to monitor the maximum allowable total oil content according to ISO 8573-5.

The integrated electronics and compact design enables detection of residual oil content in compressed air systems in a real-time method, without the usual diversion through physical-chemical analysis. Hence, the production processes and machines can be protected round the clock. The oilguardPRO has a measured value display at which the user can read the current condition of the plant. The display of material concentration is in ppm or mg/m³ at standard conditions.

The user is provided with a pre-alarm and a main alarm. The device raises an alarm if the readings are outside the tolerance limits. Through a switchable median value filter and configurable alarm delay, the oilguardPRO can be configured to ignore short-term fluctuations of values in the system, in order to avoid false alarm and unnecessary interruption of the process.

An RS 485 serial interface as well as a 4 ... 20 mA current loop output is available for integration into superordinate system.

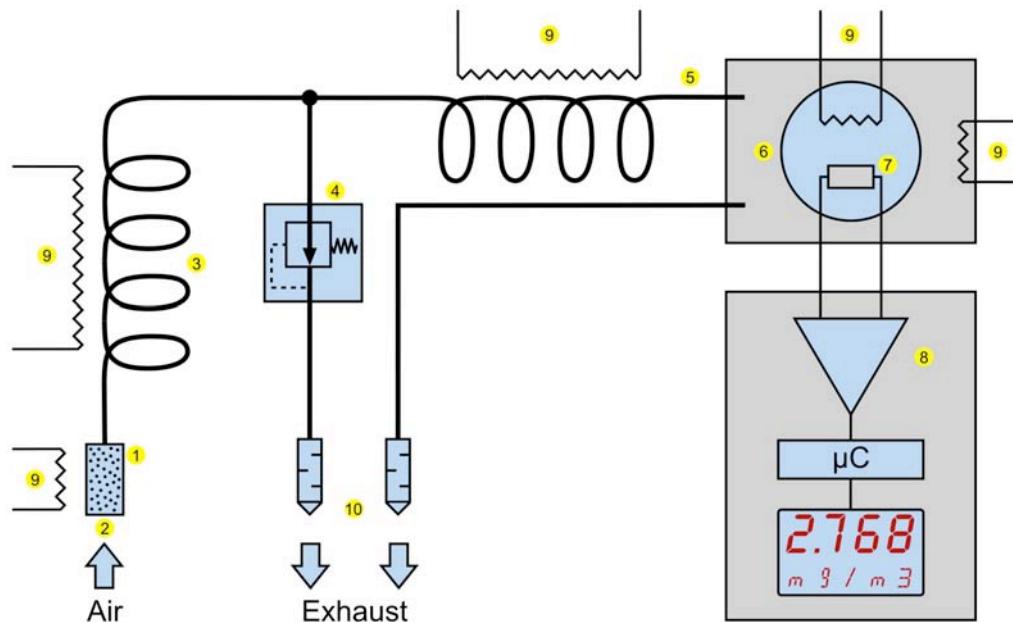


5.4 Operating principle

The withdrawal of compressed air is done over a heated sampling system (9). At the sensor head (1) the gas sample is taken out through a sintered metal filter disc (2) and heated in an expansion capillary (3). With a regulator (4) the defined flow rate is achieved. At the outlet of the capillary (5) the sample air expands to nearly ambient pressure and through the analysis cuvette (6) comes into contact with the sensor element (7).

Heart of the sensing system is a metal oxide semiconductor sensor specially tailor made as per the application, which is optimised with the help of active coating additives for detection of long chain hydrocarbons. The sensor surface is heated. Through platinum and palladium refinement, the sensor surface works as a catalyst and the hydrocarbons contained in compressed air gets oxidised. At the boundary surface of the metallic oxide particle, the load river is minimized due to oxygen deficiency and the change in conductance so adjusted is electronically evaluated.

The software in the micro-processor controlled evaluation unit (8) analyses the change in signal through mathematical algorithms and determines the hydrocarbon content in sample gas with the help of stored calibration tables. for typical CH-mass distribution of compressor oil, the oil content is calculated and displayed in mg/m³ from the values stored in the device. The measured values are provided in both analogue and digital format and the alarm and relay outputs are triggered.



6 Construction of the device and components

6.1 Sensors and measuring circuit

The measurement system has several different internal sensors and calculates the proportion of hydrocarbons contained in the compressed air from various measured values.

The sampling head, the capillary line and the metal oxide sensor with the measurement block are heated to prevent hydrocarbon condensation.

6.2 Display

6.2.1 Display

The measurement system has a large, double line display that allows to read the measured values even from a distance. In the upper section with four segments, the measured value is displayed. The bottom line is provided with 5 alphanumeric in which the unit of measured value is displayed during normal operation.

In configuration mode, the alphanumeric line is user guide in menu. It is operated with five keys.

6.2.2 Status signal

Through the light indicators (LEDs) attached to the control panel, the user can immediately know the status of the device. The lights indicators have the following meanings:

Warning	Warning display, is off during normal operation and blinks red at pre-alarm
Alarm	Warning display, if off during normal operation and blinks red at main alarm
Flow	Warning display, if off during normal operation and blinks red in case of very low flow
Service	Warning display for maintenance interval: After 300 days, the LED blinks red and reminds of the service due. After 400 days it additionally gives out an acoustic signal.
Relay 1	Glows green with closed Relay 1
Relais 2	Glows green with closed Relay 2
Info-LED	(Integrated in Info key) glows , if the Info-key is active
Set-LED	(Integrated in Set key) glows, if the Set-key is active

6.2.3 Measurement unit

The changeover of measurement unit is done with the Info key and selection of the unit with the up / down keys. If no key is pressed for a period of 30 seconds, the device goes into default mode and again displays the residual oil content in mg/m³.

The residual oil content can be shown in the following units:

- in mg/m³, resolution 0.001 mg
- in µg/m³, resolution 0.001 µg
- in mg/kg, resolution 0.001 mg
- in ppm, resolution 0.001 ppm, reference to Hexane (C₆H₁₄)
- in ppb, resolution 0.001 ppb, reference to Hexane (C₆H₁₄)

The following secondary parameters can be measured in the device:

- The mass (Flow) in measuring circuit
- The measuring block temperature in °C, °F
- The housing inside temperature in °C, °F
- The gas pressure in compressed air system
- The ambient pressure

Only the gas pressure and ambient pressure are displayed over the control panel. All measurements can be shown through the serial interface and the software PCLOG, including the flow and temperature.

6.2.4 Error messages

Errors are shown on the upper display line of the double line display as ERROR

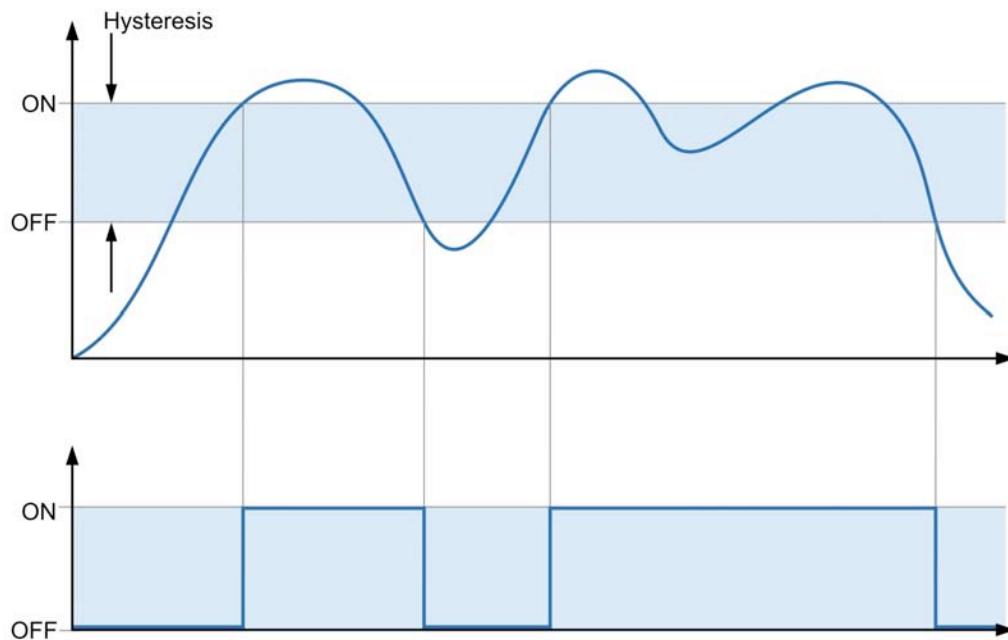
Following errors are defined:

GAS	Residual oil sensor has failed, no valid measured values
CRXXX	Monitored EEPROM range with the CRC number XX has discrepancies. As a result, the calibration data is no longer valid! Please contact the service Hotline.

6.3 Switch output

For the purpose of triggering external actions, the device has two limit switches independent of each other. These are so-called two-point controller with hysteresis and configurable time behaviour.

In the set-up menu, the switch On point, switch Off point, On-delay, Off-delay can be adjusted. The switching behaviour is also adjustable (i.e. open or closed contact in the initial condition).



As the two limit switches are independent of each other, they can be used independently, for example, triggering of two different switch points, or for a pre-alarm and main alarm. Each output is provided as a potential free relay changeover contact, which is brought out over the M12 extension socket. The switch rating is designed for safe low voltage which is 40 V DC / 5 A. For the control of high power actuators or mains operated components, an external relay or contactor is required.

Technical data of switching stage

Relay contact switching voltage	40 V
Relay contact switching current	max. 5A
Adjustable range	0.001 ... 5 mg/m ³
Hysteresis	Optional, adjustable
Switch on-delay	0 ... 3600 sec.
Switch-off delay	0 ... 3600 sec.
Switch channel	2
Switching behaviour	

6.4 Alarm output

The device has two low voltage based output for alarm triggering which are provided for direct control of signal generators. The two outputs are brought out to the 15-pin extension socket. The status of alarm output is also displayed on the front panel with two LEDs.

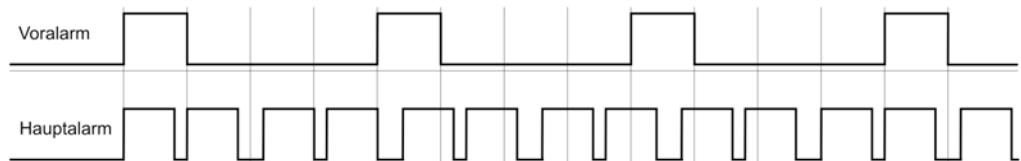
One output is used to control the acoustic signal generator (buzzer) and provides 15 V DC for a max. 15 mA load rating. The second output is used to control a light signal and delivers a maximum 60 mA current at 15 V output voltage.

Please only use the signal devices available as accessories!

6.4.1 Alarm management

The device has a two-stage alarm system. At pre-alarm, the "Warning" LED shortly blinks, with long gap between the blinking signals. The optical and acoustic alarm are also triggered.

At main alarm, the "Alarm" LED blinks for a longer time with short gaps between the blinking signals. In addition, the optical alarm generator is also triggered during main alarm.



The acoustic signal can be acknowledged by the confirm key and switched off. However, the optical signal remains active until the fault is removed and the residual oil level again lies below the alarm threshold.

After 6 hours, the acoustic signal is switched on again if the alarm signal is still present.

In the configuration menu, it can also be defined whether the alarm must be acknowledged in principle or to be deleted again by itself after the value has come within limits.

6.5 Maintenance interval

To verify the measuring accuracy, we recommend that once in a year the device should be sent back to the calibration laboratory of PRO AIR GmbH for servicing and calibration.

The service LED provided on the device is meant for prompting the user of the device about the required maintenance intervals. After 300 days of operation, the LED blinks red at short intervals. In such a case, please send the device to our calibration laboratory:

PRO AIR GmbH
-Calibration laboratory-
Peter-Müller Street 29a
80997 Munich

If the device is not sent for servicing, you will hear an additional acoustic signal after a total of 400 days and the "Warning" LED and the external warning lights blinks. Moreover, the display shows the message "Service".

The acoustic signal can be acknowledged over the confirm key and switched off for 6 hours. However, the optical signal still remains active until the device waits.

6.6 Analogue output

The device has an analogue output for an industry standard signal of 4 ... 20 mA. At this output, the measured residual oil reading is provided, which can then be evaluated, for example, with a PLC or data acquisition system.

The scaling of the signal is 4 mA = 0 mg/m³, 20 mA = 5 mg/m³

The output is potential free and passive. Therefore the power supply must be externally provided. The output is a current source. The maximum load resistance is

determined by the operating voltage which must be in the range 12 ... 24 V. Further components may be required to connect to a superordinate control system. Please ask the manufacturer of superordinate control system about the possible requirements.

6.7 Serial interface

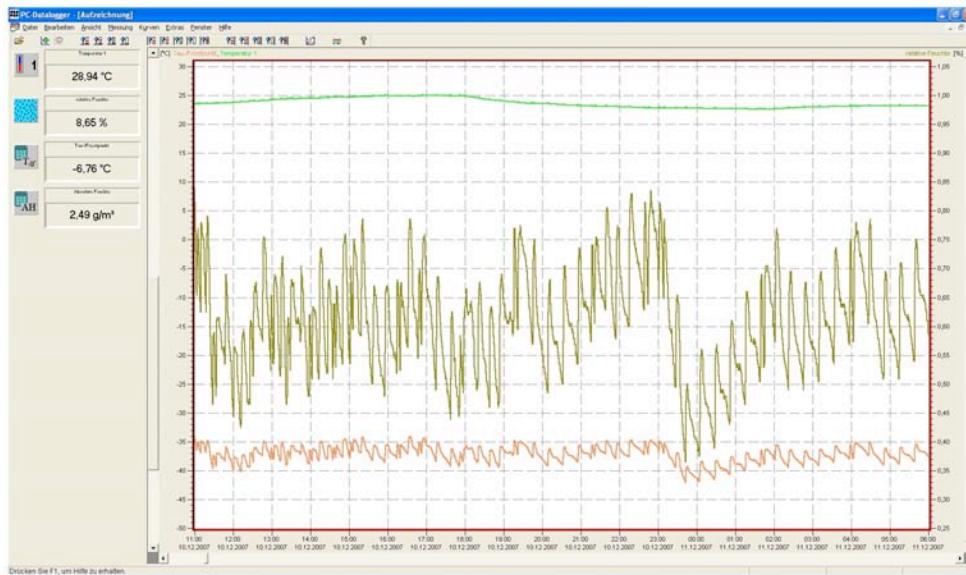
The measured hydrocarbon values are cyclically delivered over the serial interface if this functionality is unlocked in the device configuration. The documentation of interface protocol is appended.

The signals are given out as RS-485 signal. The interface is not potential free. The signal is given out as an ASCII string. The interface protocol is available on request. The data format is compatible with the software PCOIL which can be obtained from us as an accessory.

6.7.1 Software PCOIL

The software is used for visualization of the measured residual oil values of the system and is a powerful tool for commissioning.

The data recording can be saved, printed or transferred to other programs (e.g. EXCEL).



7

Selection of mounting location



Select a location for installation which does not influence the proper functioning of oilguardPRO. Installation in an unfavourable environmental conditions affect the measurements and can lead to malfunctioning as well as damage to the sensor.

The device should not be operated in explosive or fire-risk environment, in corrosive chemicals, superheated steam, very hot environment or in very dirty conditions.

7.1 Pre-requisites for installation

- ▶ Select a clean, dry and dust free area.
- ▶ The oilguardPRO should not be used in hazardous atmosphere!
- ▶ The measuring process must be carried out in an oil and grease free atmosphere
- ▶ Ambient temperature to be +10°C to +45°C.

7.2 Installation scheme 1 (Minimum requirements)

The illustrated installation shows the minimum requirements of oilguardPRO. Other installation types are also possible (as long as the defined operating conditions are ensured).



- 1 Compressor
- 2 Cyclone filter (optional while using a compressed air reservoir)
- 3 Compressed air reservoir
- 4 Fine filter (MFO), with automatic condensate drain
- 5 Minimum requirements: Cold dryer
- 6 Super fine filter (SMA) with manual drain

Oil and grease free area:

oilguardPRO , inclusive of evaluation electronics

For maintenance work, it is recommended to install a bypass on the oilguardPRO, which is generally applicable for all serviceable components in compressed air systems.

Please note that this bypass also must be oil and grease free!

CAUTION! Dirty inlet air is a worse condition! If the oilguardPRO is used under worse conditions, the device can get dirty, damaged or destroyed.



7.3 Installation scheme 2 with Active charcoal adsorber



- 1 Compressor
- 2 Cyclone filter (optional while using a compressed air reservoir)
- 3 Compressed air reservoir
- 4 Fine filter (MFO)
- 5 Minimum requirement: Cold dryer
- 6 Super fine filter (SMA) with manual drain

Oil and grease free area:

- 7 Active charcoal adsorber
- 8 Post filter (MFO) with manual drain

oilguardPRO , inclusive of evaluation electronics

The illustrated installation shows the minimum requirement of oilguardPRO in combination with a active charcoal absorber. Other installation types are also possible (as long as the defined operating conditions are ensured). For maintenance work, it is recommended to install a bypass on the oilguardPRO, which is generally applicable for all serviceable components in compressed air systems. Please note that this bypass also must be oil and grease free!

CAUTION! Dirty inlet air is a worse condition! If the oilguardPRO is used under worse conditions, the device can get dirty damaged or destroyed!



7.4 Installation scheme 3 with Adsorption dryer and Fine filter



- 1 Compressor
- 2 Cyclonic separator (optional while using a compressed air reservoir)
- 3 Compressed air reservoir
- 4 Fine filter (MFO)
- 5 Super fine filter (SMA)
- 6 Adsorption dryer

Oil and grease free area:

- 7 Dust filter (MFO) with manual drain

oilguardPRO , inclusive of evaluation electronics

The illustrated installation shows the requirement of oilguardPRO with filter combination and recommended adsorption dryer. Other installation types are also possible (as long as the defined operating conditions are ensured). For maintenance work, it is recommended to install a bypass on the oilguardPRO, which is generally applicable for all serviceable components in compressed air systems. Please note that this bypass also must be oil and grease free!

CAUTION! Dirty inlet air is a worse condition! If the oilguardPRO is used under worse conditions, the oilguardPRO can get dirty, damaged or destroyed!



**7.5 Installation scheme 4 with adsorption dryer and active charcoal adsorber
(Ideal Installation, recommended by Pro air GmbH)**



1 Compressor

2 Cyclone separator (optional while using a compressed air reservoir)

3 Compressed air reservoir

4 Fine filter (MFO)

5 Super fine filter (SMA)

6 Adsorption dryer

Oil and grease free area:

7 Active charcoal adsorber

8 Dust filter (MFO) with manual drain

oilguardPRO, inclusive of evaluation electronics

The illustrated installation shows the ideal requirement of **oilguardPRO** with filter combination, adsorption dryer and recommended active charcoal absorber. Other installation types are also possible (as long as the defined operating conditions are ensured). For maintenance work, it is recommended to install a bypass on the **oilguardPRO**, which is generally applicable for all serviceable components in compressed air systems. Please note that this bypass also must be oil and grease free!

CAUTION! Dirty inlet air is a worse condition! If the **oilguardPRO** is used under worse conditions, the **oilguardPRO** can get dirty, damaged or destroyed!



7.6 Installation scheme 5 with converter and cold dryer (recommended by Pro air GmbH)



- 1 Compressor
- 2 Cyclone separator (optional while using a compressed air reservoir)
- 3 Compressed air reservoir
- 4 Fine filter (MFO)
- 5 Converter

Oil and grease free area:

- 6 Super fine filter (SMA)
- 7 Cold dryer
- 8 Dust filter (MFO) with manual drain

oilguardPRO, inclusive of evaluation electronics

The illustrated installation shows the requirements of **oilguardPRO** with converter and cold dryer. Other installation types are also possible (as long as the defined operating conditions are ensured). For maintenance work, it is recommended to install a bypass on the **oilguardPRO**, which is generally applicable for all serviceable components in compressed air systems. Please note that this bypass also must be oil and grease free!

7.7 Installation scheme 6 with converter and adsorption dryer (Ideal installation, recommended by Pro air GmbH)



- 1 Compressor
- 2 Cyclone separator (optional while using a compressed air reservoir)
- 3 Compressed air reservoir
- 4 Fine filter (MFO)
- 5 Converter

Oil and grease free area:

- 6 Dust filter (MFO)
- 7 Adsorption dryer
- 8 Dust filter (MFO) with manual drain

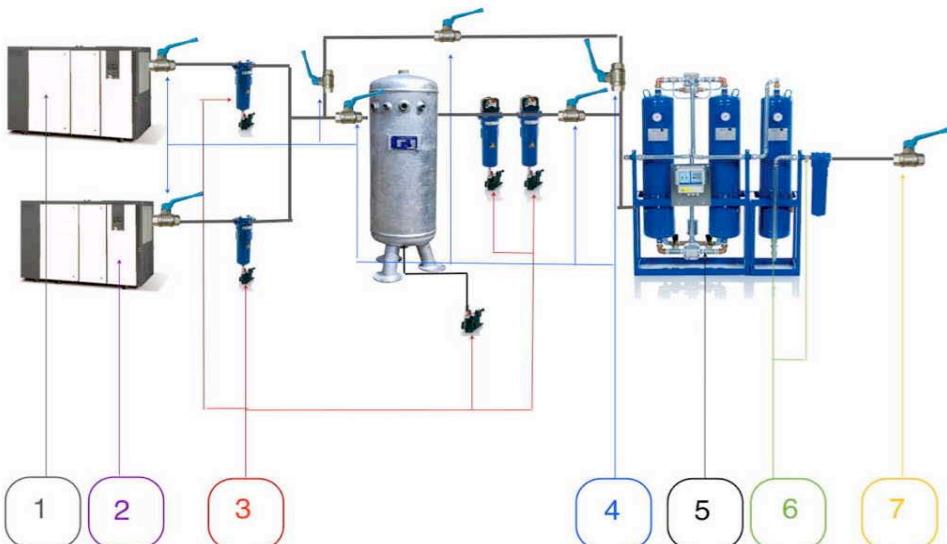
oilguardPRO , inclusive of evaluation electronics

The illustrated installation shows the optimum requirements of oilguardPRO with converter and recommended adsorption dryer. Other installation types are also possible (as long as the defined operating conditions are ensured). For maintenance work, it is recommended to install a bypass on the oilguardPRO, which is generally applicable for all serviceable components in compressed air systems. Please note that this bypass also must be oil and grease free!



The company Pro air GmbH recommends to use certified processing technology and approved filters.

7.8 Dangers of contamination with hydrocarbons



- 1** Trotz Einsatz eines ölfrei verdichtenden Kompressors kann Öl aus der Ansaugluft in das System gelangen. Durch die Kompression wird dieser Anteil deutlich verstärkt und kann detektiert werden.
- 2** Öleingespritzte Kompressoren tragen trotz moderner, hochwertiger Abscheidesysteme Restöl in das folgende Druckluftsystem ein. Besonders häufiges Be- und Entlasten des Verdichters erhöhen den Öleintrag erheblich.
- 3** Moderne automatische Kondensatableiter entfernen bereits einen großen Anteil ölhaltiges Kondensat aus dem System. Nur mit dieser Technologie können die Filter hochwertig abscheiden.
- 4** Ventile, Kugelhähne, Fittings usw. werden häufig mittels geeigneter Gleitmittel eingebaut. Dies führt zu den häufigsten Kontaminationen in Druckluftsystemen, da Schmiermittel wie Fette etc. Kohlenwasserstoffe enthalten.
- 5** Alle Ventile, Fittings usw. im Trockner müssen 100% ölfrei und fettfrei sein. Weiterhin hat der Drucktaupunkt des Trockners direkten Einfluss auf die Aktivkohle (Standzeit, Abscheidegrad). Je besser der Taupunkt, desto besser die folgende Abscheidung.
- 6** Aktivkohle verändert seinen Abscheidegrad extrem in Abhängigkeit von Temperatur und relativer Feuchte. Neue Aktivkohle muss erst längere Zeit „austrocknen“ bis ein erwünschter Abscheidegrad erreicht wird. Alle installierten Fittings, Dichtungen etc. müssen fettfrei bleiben um den gewünschten Abscheidegrad zu erfüllen.
- 7** Alle nachgeschalteten Bauteile (Kugelhähne, Fittings, Kupplungen, Ventile usw. müssen 100% fett- und ölfrei gehalten und eingebaut werden um eine nachträgliche Kontamination zu verhindern.

8 Mounting

8.1 Procedure

The installation involves the following steps:

1. Selection of sampling point and mounting location of the device.
2. Fitment of oilguardPRO-unit
3. Mounting of sampling probe (see below)
4. Connecting the device to the power supply
5. Electrical connection
6. Putting into operation
7. Adjusting the switch points
8. Test and functioning check

8.2 Mounting of the measuring device

Stationary mounting of the device is recommended on a wall at the withdrawal point directly over the pipeline. The line must be able to carry the additional weight of the sampling probe.

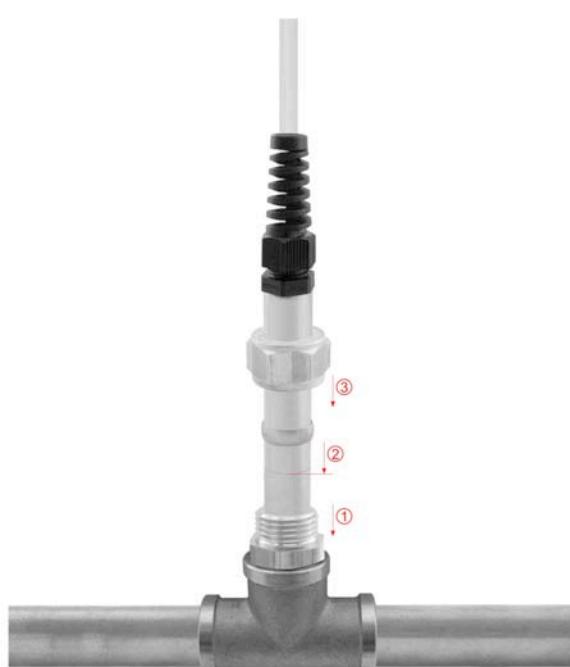
8.3 Mounting of the sampling probe

For maintenance work, it is recommended to install a bypass on the oilguardPRO, which is generally applicable for all serviceable components in compressed air systems. Please note that this bypass also must be oil and grease free!

It is important to ensure that the line does not swing or vibrate, otherwise the withdrawal probe can get damaged by this. Therefore, direct mounting next to the compressor / dryer is not allowed.

The mounting of the sampling probe is done with a oil and grease free clamping ring fitting. For this, proceed step by step as follows:

- ▶ Screw the mounting thread on the pipeline (1). Use Teflon tape as sealing material.
- ▶ First put the tightening nut and then the clamping ring on the measuring probe.
- ▶ The clamping ring must directly sit on the intended section on the lower 1/3rd portion of the measuring probe (2)
- ▶ As a last step, the mounting nut must be tightened (3)



8.4 Putting into operation



The device comes with power cord. After plugging the device into a mains socket, it immediately goes into operation. There are no further switches. After switching on, the device is first heated and the sensor is calibrated. After approx. 20 minutes, it indicates the first reading, however, this can still change. If the connection to the compressed air network has been just done before, then the readings can probably fall further. After about 6 to 24 hours (depending on the duration of storage), the measured values normally become stable.

9 Connection of external components

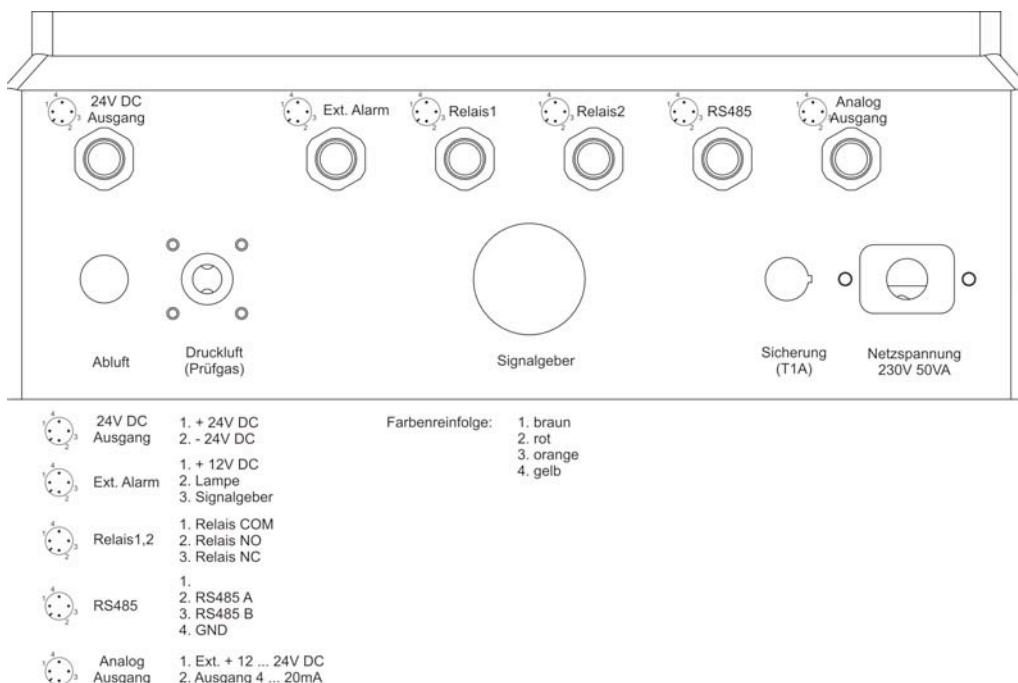


The product should be used and applied only according to its intended application.

The installation of the control and maintenance work must be carried out by only trained personnel. Installation work must be carried out in pressure free and voltage free condition. The safety regulations must be followed!

The device can not be serviced by the end user. For all maintenance and calibration work, the manufacturer should be contacted.

9.1 Connection to the device



9.2 Pneumatics

For connecting to the system, only the connection "MEASURING AIR" to be used. The maximum operating pressure of the standard model is 10 bar. Special models for higher pressures (16 bar / 50 bar / 350 bar) are available on request!

9.2.1 Input measuring air

The connection "MEASURING AIR" is done on a connection in the compressed air network. It is a commercial fitting (Swedgeblock (R)) compatible connection for 6 mm stainless steel pipe. The connection is also suitable for 6 mm PTFE connection hoses, provided a protection sleeve is put into the hose.

The connection should be preferably done through the withdrawal probe included in the scope of supply which is meant for connection to this gland.

9.2.2 Exit air

The measurement air is set free into the atmosphere from the connection "EXIT AIR". The connection should not be altered or closed.

9.2.3 Reference gas

The connection "REFERENCE GAS" is sealed during delivery. The connection is meant for calibration and can not be used by end users. The connection is only to be applied with expanded sample gas (pressure-less with respect to ambient pressure). In normal operation, the protection cap must be screwed on to close the connection in gas tight manner.

9.3 Electrical connection



The product should be only used and applied as per its intended application.

All external connections should only be used with low voltage protection. This is also applicable for relay outputs. For switching high power components, external contactors must be used.

The connection is through standard industrial plug connectors of type M12. The plug connectors for the different functions are identical and not safeguarded against exchange among each other. The user has to essentially take care that the correct plug connector is applied as per the labelling of the device. In case of wrong connection, the device can get damaged.

The device is provided with outputs for extension of functionality:

- ▶ An external alarm light for remote mounting, if the device is mounted at an inaccessible location, for example in compressor room.
- ▶ Two potential free alarm contacts (changeover, residual loop current) for signalling of pre-alarm and main alarm.
- ▶ A connection for supply of external extensions (Optional) with 24 V DC/max 100 mA.
- ▶ An analogue output 4 ... 20 mA for connection of a PLC or a superordinate system.
- ▶ A digital RS 485 interface for connection of a PC over COM-Port or USB-interface. For this purpose, a software PCLOG is available as accessories, to record the measuring curves.

9.3.1 Mains connection and safety



The device is provided with a mains cable and is meant for connection to a earthed mains plug socket. The device has a wide range of voltage input and can be operated from 90 V to 230 V mains voltage and at 50 or 60 Hz supply frequency.

The plug socket must be protected with a 2 to 16A rated circuit breaker. **Locally made connection is not allowed.**

The device is primarily protected with a 1A fuse, which is located below the device near the mains cable. To check or change the protection, the power supply plug is to be taken out.

The device has no user serviceable safety devices or other components. The device is sealed and should not be opened. In case of violation, the guarantee and warranty claim becomes void!

9.3.2 DC 24 V



This connection is for an external UPS (Uninterrupted power supply) or a standby power operation. The connection should not be used for other purposes, unless the manufacturer has confirmed the application in writing.

The M12-plug for the 24 V DC output is configured as follows:

Signal	Pin	Function
SUPPLY-		Operating voltage ground potential of the device
SUPPLY+		Operating voltage, 24 V DC, max. 2 A

9.3.3 Optional

This socket is unoccupied in normal delivery condition and is meant for special customised functionalities. Further documentation, including the layout of M12 socket, is provided by the manufacturer with the special accessories.



The connection should not be used, unless the manufacturer has confirmed the application is writing.

9.3.4 Analogue out

The device has an analogue output for an industrial standard signal 4 ... 20 mA. The measured residual oil readings are furnished at this output.

The scaling of signals during delivery is 4 mA = 0 mg/m³, 20 mA = 0.1mg/m³

The scaling can be changed in the device configuration. The output is potential free and passive. Therefore, the supply must be externally provided with 12 ... 24 V.

The M12-plug for the analogue output is configured as follows:

Signal	Pin	Function
GND ANA		Reference potential for analogue output, not potential isolated to device ground
OUT ANA		Analogue output 4... 20 mA for residual oil 0 ... 0.1 mg/m ³

9.3.5 Relay output pre-alarm and main alarm

The device has two independent switch points, each of which activates a relay. The relays can be used, for example, as pre-alarm/main alarm. The relay has a changeover contact and can be used as both normally open or normally closed type.

Both the outputs are configured as active at works, that is in normal operation (and when the operating voltage is present), the relay is energized. In case of emergency (or in case of loss of operating voltage) the contact will open (safety function).

The relays are potential free, but may be used only for switching of safe low voltage!



The M12-plug for the relay is assigned as follows:

Signal	Pin	Function
REL1O		Relay pre-alarm, normally closed
REL1S		Relay pre-alarm, normally open
REL1C		Relay pre-alarm, common-connection ("centre pin")

Signal	Pin	Function
REL2O		Relay main alarm, normally closed
REL2S		Relay main alarm, normally open
REL2C		Relay main alarm, common connection ("centre pin")

9.3.6 External Alarm and Buzzer

If the unit is mounted at an inaccessible location, an external alarm light can be connected at the extension socket. The alarm output is activated when the main alarm condition is reached.

The operating voltage of 15 V is provided internally by the electronics and can be loaded up to 50 mA in total. The switch outputs are open-collector transistor outputs with max. 50 mA switching current rating.

A suitable model is available with us as an accessory. Please do not use other brands, the device can get damaged due to unacceptable current consumption!

The M12-plug for the external signal generator is assigned as follows:

Signal	Pin	Function
ALARM S		Switch output for external acoustic signal generator (Hooter), Open collector output, clocked, wired against ground
ALARM SUP		Operating voltage for signal generator, 15 V DC/50 mA (provided by the device for the signal generator)
ALARM L		Switch output for external optical signal generator (Blinking light), Open collector output, clocked, wired against ground

9.3.7 RS 485 Serial Output

The measurement data is delivered as ASCII coded RS 485 signal, if this function is kept free in device configuration. The interface is not potential free. The interface protocol is available on request. The data format is compatible with the software PCLOG which can be obtained from us as an accessory.

The M12-plug for the serial RS485 output is assigned as follows:

Signal	Pin	Function
RS485-A		RS 485 Signal, line A
RS485-B		RS 485 Signal, line B
GND		Ground potential

9.4 For the rare cases...

If the device does not go into operation, please check the following points:

- ▶ Is the voltage available at the mains plug point?
- ▶ Is the mains plug correctly inserted?

If any of the advanced functions on the external connection socket does not produce the desired results, please check the following points:

- ▶ Whether correct connection plug has been used?
- ▶ Is the plug correctly assigned?
- ▶ Is the desired function or operation deactivated in the configuration menu of the software? Are all these adjustments correct ?
- ▶ Does the specification of the accessories match with the specified data of the oilguardPRO? Are all these adjustments correct?

If you have checked all possible causes, and still the malfunctioning is not resolved, immediately contact our customer service. Do not open the device, otherwise the warranty claim becomes void!

10 Operation

General notes for description of operating procedure



All illustrations of the display, numerical values represented configuration are examples, which are used to explain and clarify the explained content. The actual display on your device may vary as per the selected settings or environmental conditions.

10.1 View of the device front and operating elements



Operating elements



10.2 Description of the displays

View of the Displays	Function
	The upper display line is for showing the measured values in measuring mode and for display of adjusted values in configuration mode.
	The lower display line is for showing the physical units in measuring mode and to display the current menu item and work as a user interface in configuration mode.
	The operating panel with keys are for configuration of the device.

10.3 Meaning of the LEDs

Die LEDs provide the feedback to user on compressed air quality,s switching status of the outputs and upcoming service intervals:

LED Description	Meaning if LED switches on/blinks	Meaning if LED is switched off
Service	Blinks, if the intended service interval is reached (contact manufacturer!)	Normal operation
Flow	Blinks if the sample air quantity is too low. Check system pressure!	Normal operation, sample air quantity is in order.
Alarm	Blinks, if the adjusted main alarm limit is exceeded	Normal operation, value below the limit
Warning	Blinks, if the adjusted pre-alarm limit is exceeded	Normal operation, value below the limit
Relay 1	Relay 1 is active (=closed)	Relay 1 is inactive (=not closed)
Relais 2	Relay 2 is active (=closed)	Relais 2 is inactive (=not closed)

10.4 Operation of the keys

The keys on the control unit perform the following functions in the device mode:

Key	Designation	Function in measuring mode	Function in configuration mode
	INFO-Key	Selection of measurement dimension/ unit (default-display)	Nil
	Setting-Key	Access to advanced device configuration (only for authorised technical personnel), password protected	Exit selection
	ProAir Key	Access to device configuration, password protected	Confirm selection
	Down	Selection of different measurement dimensions	Previous menu option, reduces the adjusted value in selection menu, if kept pressed increases the display speed of the adjusted value
	Up	Selection of different measurement dimensions	Increases the adjusted value in selection menu, if kept pressed increases the display speed of the adjusted value

10.5 Display of measured value

In measuring mode, the residual oil value is shown in mg/m³ as default display. By pressing the Info key one can reach to a selection, in which further measurement dimensions and different units can be displayed with the help of up/down keys. The display of alternative measurement dimensions or unit is only temporary. After approx. 1 minute of the last key stroke, the device again changes over to the standard measured value display in mg/m³.

10.6 Settings

To make settings on the device, it must be changed to the operation mode "Configuration". This is only possible for authorised users, since a password is needed for it. The details of password are described later in this documentation.

The configuration menu is sub-divided into 3 levels. In the lowest menu level, the settings can be changed. The menus have the following structure:

1. Menu level	2. Menu level	3. Menu level	Description
MAIN	RELAY	REL 1	Relay 1 Operation mode 1-4
		REL 2	Relay 2 Operation mode 1-4
	ALARM	MOdE	Alarm Operation mode 1-5
		TEST	Alarm Test
		dEV	PIN Password change for main menu
	OP d	OP d	Previous working days
		SVR d	No. of days to service
		SW Vr	Software version number
	RESET	SR NO	Device serial number
		RESET	Fresh start of the device
RESP	ppm	RESP	Adjustment factor for residual oil determination
		molM	Mean molecular weight of the oil
	OUT	REL1	Activation point
		OFF P	Deactivation point
		ON T	ON delay
		OFF T	OFF delay
	REL2	ON P	Activation point
		OFF P	Deactivation point
		ON T	ON delay
		OFF T	OFF delay

	ANA	MN MV	Measured value min. Current
		MX MV	Measured value max. Current
ALARM	PRE	ON P	Activation point
		OFF P	Deactivation point
	MAIN	ON T	ON delay
		OFF T	OFF delay
MEAS	CALC	ON P	Activation point
		OFF P	Deactivation point
	LOG	ON T	ON delay
		OFF T	OFF delay
MEAS	MEAN		Mean value filter
	LOG	SENd	Start Data logging

10.7 Access to configuration mode

The configuration mode is accessed by pressing the settings key. To prevent change of settings of the device by unauthorized persons, first the password must be entered. (**ex-works, '0001'**). The password can be changed later by the authorised user (see description in the following chapter). To enter your password, please use the Up/Down keys. The longer you hold any of these keys, the faster will increase the displayed numerical value of the password. To confirm the password entry, the "ProAir key" must be pressed for 3 seconds.

By pressing the settings key, you can go back one level in the menu and by pressing the ProAir key, you can go forward one level. You can browse through the different menu items by pressing the up / down keys and change values which can be set for certain menu items.

The lower display line shows the device settings to be changed and the upper display line shows the changed values of the corresponding device settings. A device setting can be changed if the value to be adjusted appears bright in the upper display line.

Display	Operation	Device setting
		Default-Measured value display
		By pressing the settings key, it goes to the input prompt for password.
		Now the password can be entered with the help of Up/Down keys (The default password at works is 0001).
		To confirm the password, the ProAir-key must be kept pressed for 3 seconds.
		You are now in the first level of configuration menu.

10.8 Settings 'MAIN' (General)

Display	Device setting
	Settings of the output relay
	Setting of switching behaviour of the output Relay 1: 1 = normally closed 2 = normally opened 3 = always closed 4 = always opened
	Setting of the switching behaviour of the output Relay 2: 1 = normally closed 2 = normally opened 3 = always closed 4 = always opened
	Setting of the Alarm mode
	Setting of the alarm modes: 1 = automatic alarm 2 = pre-alarm active 3 = main alarm active 4 = Pre-alarm and Main alarm active
	Performing the alarm tests: Off = Alarm test inactive On = Alarm test active
	General settings
	Changing the user password, 0000 to 9999 To change the password, first the ProAir key must be pressed to enable password changing. Then the change can be done with the up/down keys. By keeping the Proair key pressed (approx. 3 secs) the changed password is saved.
	Holding the ProAir key enforces a re-start of the device.
	Display of software version
	Display of serial number (It is programmed at the factory and can not be set)

	Display of the completed number of days of operation
SVR d	Display of the number of days up to/from the recommended service date (negative number / positive number)
	Setting of response factors
RESP	
ppm	Position factor for the residual oil determination, works on the ppm base unit and hence on all residual oil units.
molM	Mean molecular weight of the target material, used for calculation of mg/m ³ and mg/kg

10.9 Settings 'OUT' (Outputs)

Display	Device settings
	Settings for switching behaviour of Relay 1
	Switch on point for relay 1
	Switch off point for relay 1
	On-delay in seconds
	Off-delay in seconds
	Settings for switching behaviour of Relay 2
	Switch on point for Relay 2
	Switch off point for Relay 2
	On-delay in seconds
	Off-delay in seconds
	Settings for analogue output
	Measured value which should correspond to analogue output of 4mA (minimum value).
	Measured value which should correspond to analogue output of 20mA (maximum value).

oilguardPRO



10.10 Settings 'Alarm'

Display	Device settings
	Settings for pre-alarm behaviour
	Switch on point for pre-alarm
	Switch off point for pre-alarm
	On-delay of pre-alarm in seconds
	Off-delay for pre-alarm in seconds
	Settings for main alarm behaviour
	Switch on point for main alarm
	Switch off point for main alarm
	On-delay of main alarm in seconds
	Off-delay of main alarm in seconds

10.10.1 Settings 'MEAS' (Measurements)

Display	Device settings
	Settings for device's internal use of sensor data
	Mean value filter for raw values
	Settings for log output
LOG	
	SENd Switch on Data output (for PCLOG)

10.11 Error messages

If the software detects an error in the functioning of device, then this message is displayed on the device.

Displayed symbol	Meaning
GAS	Residual oil sensor can not read.
HU/TE	Humidity-Temperature sensor is not present/defective.
CRCXX	Monitored EEPROM area with the CRC number XX shows discrepancies. Finally it may lead to data loss! Please get in touch with the Service-Hotline,

11 Technical data

Measuring probe	
Measuring range	0.01 ... 5 mg/m ³
Application range DTP	max +5 °C tpd, after dryer Minimum requirements: cold dryer
Detected materials	Alkanes, Alkanols, and other oil components, VOC (Volatile Organic Compound), other oxidisable materials like NOx and NH ₃ , water vapour
Measuring medium	Clean, filtered compressed air (filtered and dried, ISO 8573-Classes 2-4-2)
Pressure application range	0 ... 10 bar
Temperature application range	10 ... 40 °C
Rinsing air consumption	2l / min at 10 bar
Sensor element	Metal oxide (MOS)-Sensor

Technical data of control unit	
Operating voltage	90 V to 230 V mains voltage
Power consumption	max. 48 VA
Dimensions	300 x 400 mm x 135 mm (without screw connections and cable glands and also without blinking light!)
Connection	Over M12 plug connector
Relay output (main alarm)	Potentially isolated changeover type 40V/5A AC/DC adjustable switching polarity
Relay output (pre-alarm)	Potentially isolated changeover type 40V/5A AC/DC adjustable switching polarity
Light alarm output	15 V DC/ max. 50 mA, active
Acoustic signal indicator alarm output	15 V DC/ max. 15 mA, active
Analogue output	4 ... 20 mA für 0 ... 5 mg/m ³
Serial output	RS 485 with 38400 Baud, optional USB-connection
EMV Noise immunity	EN 61000-6-3
EMV Noise emission	EN 61000-6-3
Guarantee	24 months
Scope of supply	Instrument in wall housing with documentation and test certificate, transport packing
Rights reserved for change in technical data!	

12 Maintenance

12.1 General instructions



The device has no user-serviceable parts inside. The sensors working in the device are highly sensitive components, which can easily get damaged. Therefore, the unit is sealed and may not be opened by the user. If seals are broken, any warranty or guarantee claim becomes void!

12.2 Service Interval



When used properly, the instrument can be operational for many years. The sensor elements used are long-term stable, so that usually recalibration is not necessary. However, we recommend to send the device in every 12 months for calibration at works.

The maintenance interval is monitored internally in the device and the service LED is turned on after 300 days as a maintenance call. In addition, an audible signal is also given after 400 days.

If the device is to sent back for service or calibration, it must be strictly done in the special transport packing. If you no longer have the original packing, please order it on us.

12.3 Measuring probe



The probe comes with a stainless steel sintered filter, which should not be removed. The condition of filter should be periodically checked. Dirty filters cause a delay in response. Return the probe to the works for replacement of the filter. On request, you can get a replacement probe in advance. Please contact our customer service.

12.4 Flow



In case of unreasonable readings, it should be checked whether the flow is in order. At low flow condition, the device can not work properly. The Flow LED on the front panel of the device is off in such a case. Instead, if the LED blinks, then the flow is too low. Check the system pressure; the minimum pressure is 4 bar (g). If the pressure is in order, then the internal expansion capillary might have been blocked by some foreign material. In such a case, send the device to the works for servicing.

12.5 Regular maintenance

Regularly check the sealing of O-rings and screw connections, measuring chamber and other upstream components.

13 Trouble shooting guide

13.1 The measured oil content is too high

Cause	Troubleshooting
Stabilisation time after re-assembly	Note the stabilization time. If the measurement system has been kept unused in the environment for a long period, the stabilisation upto 48 hours must be anticipated specially in case of low residual oil concentrations. During this time, the device must be installed in the plant and its operation should continue under pressure. The flow must be present.
Oil free mounting	Take care for a completely oil-free assembly. If there are traces of oil on the sampling probe, these are included in measurement. However, oil evaporates very slowly (due to the low partial pressure), so it can take weeks until the sensor again shows correct values.
Unsuitable components	Make sure that there are no improper components in the plant: greased ball valves, lubricated O-rings of bell filters, freshly painted tank, new replaced filter certainly leads to excessively high readings.
Dew point too high	The device is meant for use in dry purified gas and it also reacts to high dew point values. Ineffective dryer, condensate formation, defective gas treatment or unsuitable pipelines can be cause for this. In case of any doubt, check the dew point at the measuring location. This must lie below +5 °C dp!
New active charcoal absorber, New active charcoal	The active charcoal is activated by steam. New absorbers are often very humid (Dew point>> 5 ° C). The dew point is to be measured and if it is above +5 ° C dp, the charcoal absorber must be dried up first before the instrument displays correct values. In normal operation, this can take several weeks depending upon the flow rate.
Too low flow, No flow	In low flow condition, the device can not work properly. If the flow LED blinks then the flow is too low. Check the system pressure, the minimum pressure is 4 bar (g).
Internal error	If the working pressure > 4 bar (g) and the internal expansion capillary might have been blocked by a foreign body. In this case, send the device to the works for service. Self repair attempts will make the warranty void!
Poor quality of inlet air	In industrial plants, often the intake air is sucked unchecked within the building envelope. In this case, all the solvents of industrial production environment solvents which are present in the ambient air are compressed and introduced in the compressed air network, leading to extreme peak loads (e.g. during cleaning operation or in solvent use). In this case, plan for a rebuilding measure and defined supply of fresh air from the open atmosphere! Please note that the fresh ambient air may also have considerably high hydrocarbon concentrations from adjacent industries (bakeries, machine shops, painting, etc)! Generally valid principle: If a person can detect odors in the air with his gas sensor "nose", then the indicator of "Oilsecure" is much more sensitive at the upper limit!
Improper measuring line of plastic.	Mount the device as directly as possible into the compressed air line and avoid plastic hose. The only suitable plastic material is PTFE, which must be considered

for this application. The compressed air region often uses PUR hoses which are not suitable for measurement of hydrocarbons!

13.2 The measured values considerably varies

Cause	Troubleshooting
Excessive changes observed in the display	The residual oil content in a plant is not constant but strongly dependent on the operating conditions and the compressor. If no converter or activated charcoal absorber is installed and the quality > Class 1, then variation in measured values with time or depending on compressed air consumption can be expected. Basically, the measured values are better overnight (under stable system) than during the day under operation.
The measured residual oil content is lower than expected.	The oil content in plants can extremely vary. Relevant factors are: the pressure in the plant, operating temperature of compressor, ambient temperature, dew point, compressed air consumption, temperature in distribution network and quality of intake air.
Starting compressor	If there is a significant increase in the measured value while starting a compressor, it is assumed that the compressor produces oil aerosol, which the oil separator is not able to adequately retain back. The facts should be carefully analysed and checked!

14 Appendix

In this chapter, some theoretical notes have been compiled together which are generally understandable for interested users. The report is primarily meant to understand the topic and avoid application errors.

14.1 Standards

Following standards are relevant in the field of Hydrocarbon determination:

- | | |
|-----------------|---|
| ISO 8573-1:2001 | Compressed Air- Contaminants and purity classes |
| ISO 8573-2:2001 | Test methods for aerosol oil content |
| ISO 8573-5:2001 | Determination of oil vapour and organic solvent content |

In the standard 8573-5, the sampling and quantitative analysis of hydrocarbon vapours contained in compressed air has been described. The **oilguardPRO** primarily orients itself with respect to the procedures used and calculation methods of this standard.

The original text of these standards may be obtained from Beuth publishers in Berlin.

14.2 Hydrocarbons in compressed air

The oil quantities, which can be contained in the compressed air, are very different. Properly treated compressed air contains very small amounts of hydrocarbons, which are difficult to measure. On the other hand, immediately after the compressor, there are very large amounts of residual oil in the compressed air which also deposit in the condensate separator.

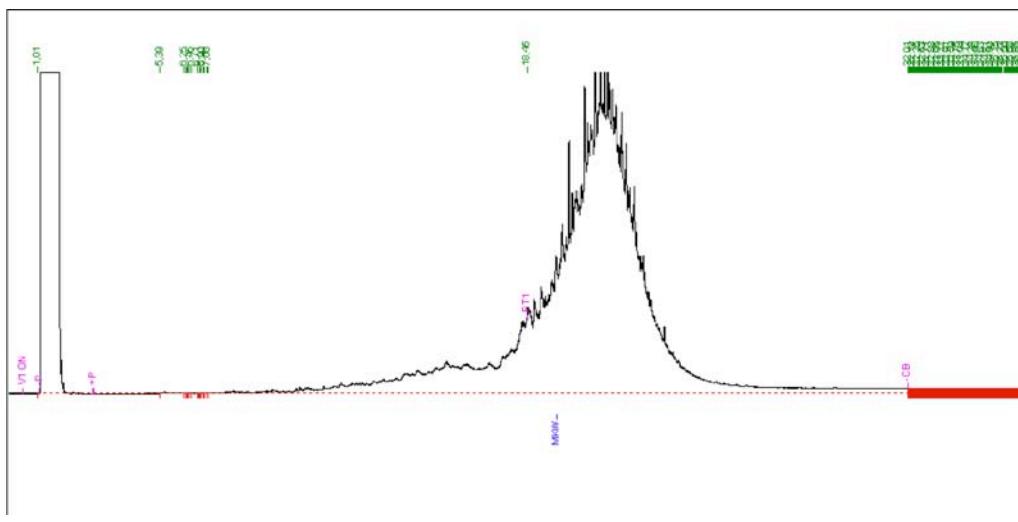
Typical measured values in the plant are:

Plant with catalyst	< 0.003 mg/m ³
Plant with active charcoal absorber	approx. 0.005 mg/m ³
Plant with SMA-Filter	approx. 0.1 mg/m ³
Plant without Filter, after the cold dryer	approx. 0.5 to 1 mg/m ³
Directly after the compressor, in air reservoir	over 5 mg/m ³ (Aerosol)

The hydrocarbon content also very strongly depending on temperature. At higher temperatures, more hydrocarbons are present in the air.

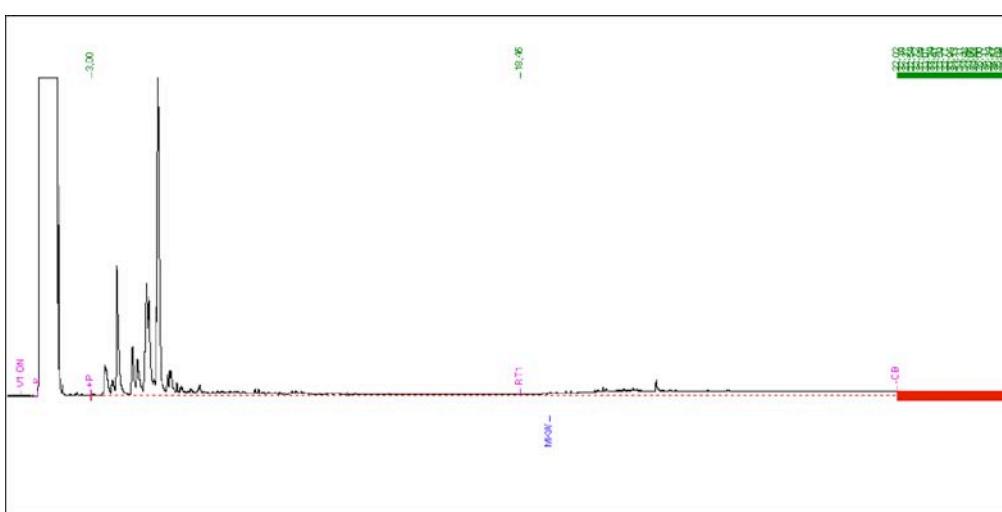
14.3 Analysis of compressor oil

The following chromatogram shows the typical composition of compressor oil. From the chromatogram it can be seen that the lubricating oil used in compressors is a very long chain compound. The main components are of chain length over C30. Short-chain components are present only in very lower concentrations.



14.4 Compressed air with gaseous hydrocarbons without aerosol

Almost all residual oil measurements are carried out in plants where there are very high quality requirements. Therefore, normally it is ensured through filter and absorber /catalyst that very less hydrocarbons are noticed in the plant. In the context of treated compressed air, all the hydrocarbons are present in gas phase. Aerosol may not be present in such plants. Following typical chromatogram is observed in such plants:



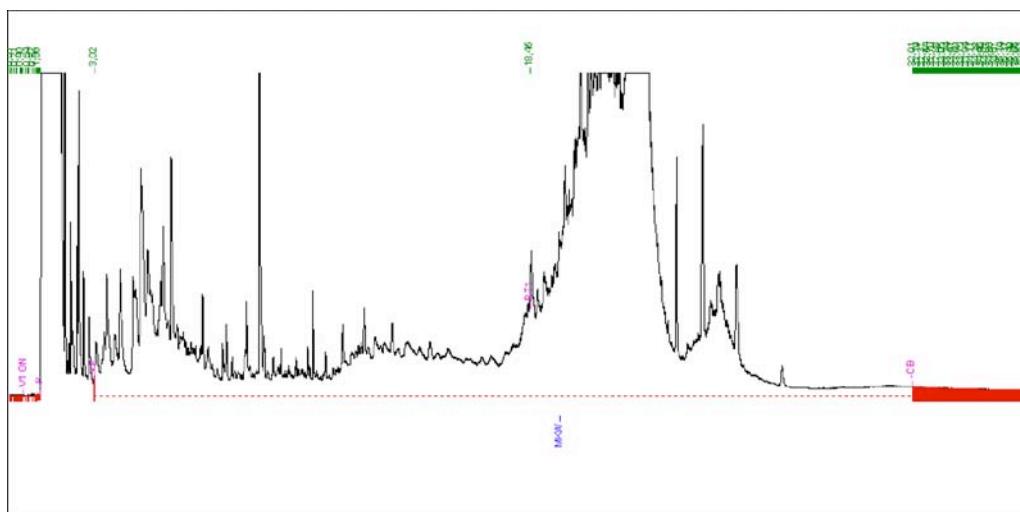
Practically, only short chain hydrocarbons are noted. Such hydrocarbons are relatively volatile and also disappear relatively fast from the pipeline network. The volume concentration is relatively low and lies in the range of residual oil Class 1 or 2.

14.5 Compressed air with gaseous hydrocarbons and aerosol

Aerosol is hydrocarbon fog consisting of small oil droplets. In compressed air systems with a proper treatment, aerosol can only occur during disorder, which is generally due to failure of many filters in succession. When aerosol occurs, the compressed air is saturated with hydrocarbons and a considerable amount of oil is introduced in the compressed air network. Some portion of it falls off at the wall and as a "wall flow" it is driven into the plant by the gas flow.

Because of aerosol, the chain length of introduced hydrocarbons of short chain (volatile) hydrocarbons shifts to much longer chain length, and becomes non-volatile components. The plant gets contaminated.

Aerosol can be immediately seen in the chromatogram, as the proportion of long-chain components dramatically increases. In such systems, there is an entirely different chromatogram:



Apart from the volatile, short-chain hydrocarbons in the lower range of chain length up to C15, long chain components are also registered due to aerosol. Since the long-chain components have much lower vapour pressure, the hydrocarbons are non-volatile and contaminate the plant over long time period.

14.6 Isokinetic sampling

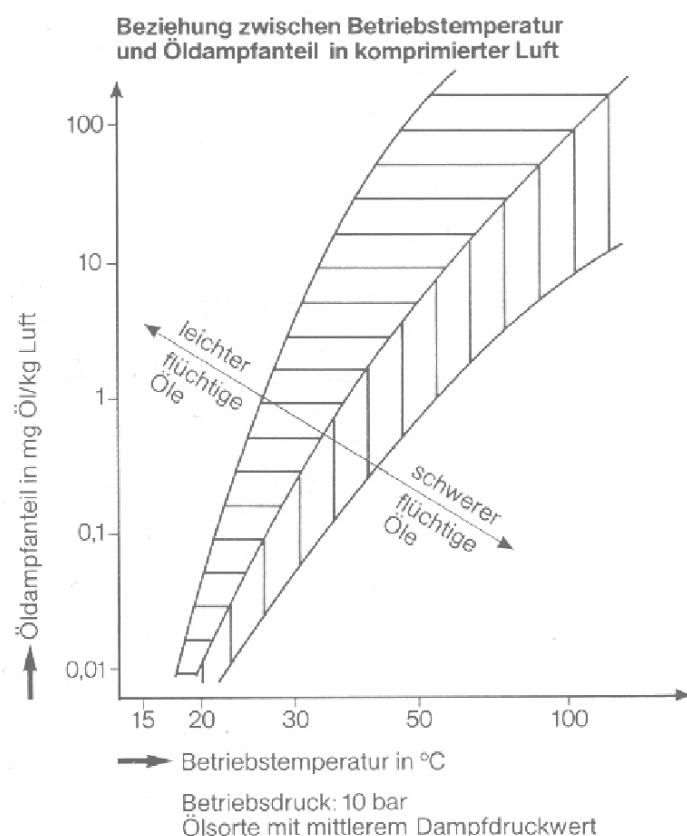
In order to carry out a isokinetic sampling for measurement of aerosol, a higher level measurement technique is required. The diverted portion of gas flow must have the same velocity as the actual gas flow in compressed air system at the withdrawal point. Moreover, the aerosols must be changed over into the gas phase to analytically capture this.

The **oilguardPRO** is meant for measuring gaseous hydrocarbons after filtration and catalyst / activated charcoal absorbers. Since, no aerosol is expected at this point, isokinetic sampling is also not necessary. According to the gas laws, gaseous components are available in the molar ratio of material composition irrespective of the type of sampling.

Therefore a special withdrawal lance, a rising compressed air or special flow conditions are not necessary!

14.7 Temperature dependency of oil vapour pressure

The vapour pressure of oil is very strongly temperature dependent. At low temperatures, the compressed air can absorb much less oil and the compressed air quality is correspondingly better. It is important to know that the vapour pressure curve has an exponential behaviour. The hydrocarbon quantity always increases more quickly with rising temperature.



14.8 Absorption behaviour of active charcoal

The active charcoal does not move the hydrocarbons as happens in a converter. During the period in which the sample gas is flown through the active charcoal, the pore structure picks up the hydrocarbons contained in the gas flow and stores them within. Thus, the hydrocarbons get accumulated in the active charcoal and the absorption becomes worse with increasing usage.

Another effect is that together with other factors, the absorption depends on the moisture in the gas stream and the temperature. At higher temperatures or higher humidity, the hydrocarbons are not so well absorbed.

In case of high temperature rise and over-saturated coal, it is even possible that the activated carbon absorbers deliver more oil than what is present at the input. This is due in Resorption behaviour of coal.

New, unused charcoal is delivered in a very moist condition. This is due to the activation of pores during manufacture, which is usually done with steam. Dew point values of 15 ° C to 25 ° C are normally the rule in new charcoal. Since the **oilguardPRO** should only be used below +5 ° C tpd, the activated charcoal absorbers must be dried before use.

Active charcoal can hold oil only in the vapour phase. Due to the aerodynamic effects, the aerosol "tunnel through" the charcoal granules up to the exit. In addition, the aerosol also saturates the charcoal in a very short time. Therefore a fine filter must be necessarily put before the active charcoal absorbers.

The active charcoal should also be monitored with the help of an oilguardPRO to have real security, and to detect the saturation of active charcoal at the right time. Through the optimisation of maintenance intervals and the additional security, the instrument amortises itself over its useful life.

15 EG-Conformance certificate

The company
Pro air gmbh
Peter-Müller Street 29a
80997 Munich
Germany

hereby declares on its own responsibility that the product

“Residual oil instrument for compressed air system, type oilguardPRO“

corresponds to the essential safety requirements that are laid down in guidelines of the council for agreement of the laws of the Member States relating to electromagnetic compatibility (89/336/EEC). This statement applies to all units that are manufactured according to the relevant production documents.

Following standards were referred to assess the electromagnetic compatibility of the product:

DIN EN 61000-6-1:2001 (VDE 0839 Part 6-1)	Electromagnetic compatibility (EMV) basic technical standard – Noise immunity for residential, industrial and commercial area as well as small enterprises
EN 61000-6-3:2001 (VDE 0839 Teil 6-3)	Electromagnetic compatibility (EMV) Basic technical standard – Noise emission for residential, industrial and commercial area as well as small enterprises

The above mentioned manufacturer holds the necessary data ready for scrutiny for evaluation of the conformity.

80997 Munich, the 3. October 2010



Ralf Kotzock, Managing Director

Notes for operating environment in the context of EMVG

The assessment of the product has been done with reference to the limits defined in standard for application in residential, industrial and commercial areas because of which the application of the product is intended for this operating environment. Typical applications points are for example residential buildings, retail space, offices, workshops, sports complex, etc.

All these application areas are characterized by the fact that they are connected to the public low voltage power supply system. The application in a more disturbed environment like for example, the typical industrial environment, problems can come especially with insufficient immunity of the product. The operation of the device at critical locations, for example, in direct proximity to large consumers, motors, frequency converters, etc. is not allowed.

16 Guarantee

The quality of our products is constantly monitored as part of our quality management system as per ISO 9001. The devices are carefully tested and calibrated prior to shipment. If they still have a reason for complaint, we attend the defect within the warranty period of 24 months for free, provided it is proved to be a failure on our part.

Prerequisite for fulfilment of the warranty is that the defect should be immediately informed to us and within the guarantee period.

The warranty is void if the equipment is not used as intended, not assembled according to these instructions, or damaged by improper handling or due to tampering with the device. Moreover, travel expenses, defective sensors, measuring probes and calibration services are excluded from warranty.

If in addition to the warranty service, necessary repairs performed, the warranty services shall be free but other services as well as postage and packing charges shall be charged extra.

In case of warranty claims due to excess liability or damages, which are not agreed by law are excluded.

Important Note: The device is equipped with an individual electronic serial number and sealed. Critical operating conditions inside the device are logged. The device may not be opened by the user or other third parties. There are no user-serviceable parts inside. The warranty shall be void if the device has been opened or removed. The serial number on the product label must not be altered, damaged or removed.

Service and calibration must be exclusively carried out through the manufacturer. It is recommended to follow the defined calibration interval.

Technology and Innovation –



Made in Germany



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The technical information in this document has been checked with adequate care at our end and is intended to inform about the product and its applications. The descriptions are not to be understood as assurance of the defined characteristics of the product and should be checked by the user for the intended application. Any possible third party patent rights are to be considered.

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